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ABSTRACTS OF PAPERS TO BE PRESENTED AT THE SIXTH ANNUAL MEETING OF THE AMERICAN PHYTOPATHOLOGICAL SOCIETY AT PHILADELPHIA, PA., DECEMBER 29, 1914 TO JANUARY 1, 1915.

The Verticillium wilt problem. C. W. CARPENTER.

A Verticillium wilt has been reported on potato, okra, egg plant, snapdragon, and dahlia.

Verticillium albo-atrum Reinke and Berthold is the cause of this wilt of the three former hosts, while a close relative *Verticillium Dahliae* Klebahn is reported as the cause of dahlia wilt. The most common wilt of ginseng is attributed to an Acrostalagmus sp. The Verticillium and the Fusarium wilt diseases are accompanied by similar symptoms and when both types occur on the same host can only be distinguished by cultural studies.

Verticillium albo-atrum causes okra wilt in New Jersey and occasionally in California, Oregon and Alabama. Isolated from okra it affects this host by inoculation up to 80% and is almost as virulent on egg plant and cotton. A spontaneous wilt of two cotton plants with this fungus occurring at Arlington, Virginia, is believed to be the first record of Verticillium as a cause of cotton wilt. Although this fungus has not been observed very frequently in the South it may be responsible for some of the damage attributed to *Fusarium vasinfectum*. It likewise occurs in the discolored vascular system of the weeds Abutilon and Xanthium, and is the cause of a wilt of snap dragon. Okra is susceptible at least to the strains from potato, egg plant and snap dragon.

In the South, *Verticillium albo-atrum* was rarely obtained from okra wilt. Instead a Fusarium morphologically indistinguishable from *Fusarium vasinfectum* Atkinson was constantly found throughout the vascular system. The inoculation work with this fungus is not completed.

The view that the genus Acrostalagmus Corda should be combined with Verticillium Nees, advanced by Reinke and Berthold (1879) and supported by Klebahn (1914) is confirmed. Hoffman (1854) has explained the complicated structure of the conidiophore tips represented by Corda (1838) in Acrostalagmus and rightly interpreted the collection of the conidia in heads in the genera Verticillium, Acrostalagmus, Tricothecium, and Botrytis. The conidia simply float in the water drop taken up from the air by the hygroscopic slime in which they are embedded. Saccardo's Section Gliocephalum (1886) of the genus Verticillium Nees (Engler and Prantl's (1900) Section Gliocladium apparently through error) should include Acrostalagmus Corda.

Before we shall be able to identify the species of Verticillium with confidence, a monographic study of this genus is necessary.

Orchard experiments in 1914. MEL. T. COOK AND G. W. MARTIN.

Experiments with finely divided sulphur were conducted in the peach orchard of the New Jersey Experiment Station at Vineland. This material was applied both in solution and as a dust, and comparisons were made with standard treatments. Scab was successfully controlled, but the material partly defoliated the trees. The same material used on apple trees gave approximately as good results as Pyrox, but not so good as lime-sulphur.

Experiments with pears showed that brown blotch could be controlled by late sprayings with Bordeaux.

A nursery disease of the peach. MEL. T. COOK AND C. A. SCHWARZE

In August 1914 our attention was called to a peculiar disease of the Elberta nursery stock. The disease attacked the young shoots a few inches back of the tips, producing cankers on one side and causing a characteristic curving as a result of the growth on the uninjured side. The cankers originate as small brown spots, which gradually enlarge until two or three centimeters in length. The diseased area becomes brown and depressed and finally splits down the center. The margin is irregular. Gum exudes from the split. The causal organism is a Sphaeropsis. The spores are oblong-ovate or ovate, brown in color and contain large oil globules. They measure 38.8–28.2μ × 11.6–13.3. Successful inoculations have been made. The disease has been observed in but one orchard, but the same or a similar disease has been found in one young orchard.

A method for excluding mites from pure cultures. C. W. CARPENTER

The writer and others have experienced serious difficulty for several years in excluding mites (Tyroglyphus sp.) from pure cultures of fungi. Sanitary methods and various schemes for control have met with indifferent success. The following method has been extensively employed for over a year and has given excellent results.

The method consists of treating the cotton plugs with the solution first devised by K. F. Kellerman, for preventing mold invasion. The solution has the following composition: 95 per cent alcohol, 95 cc.; Mercury Bichloride ½ gram.; glycerine 5 cc. For convenience it may be dyed with alcoholic fuchsin. After inoculation the plugs are inserted flush with the mouth of the tubes to prevent contact in the rack; as soon as a vigorous growth appears, 1 cc. of the solution is applied to each plug with a burette. An excess as well as treatment immediately after inoculation is to be avoided.

Studies in the genus Phytophthora. J. ROSENBAUM

In an attempt to determine the identity of a species of Phytophthora from the descriptions found in literature, it became evident that a systematic study of all the species under the same conditions was desirable. Accordingly strains of the various species were collected from as many sources as possible. Out of the possible thirteen described species ten have been collected and grown in culture. Studies were made to determine characters of taxonomic importance which could be used in the separation of the species. The studies so far made may be summed up as follows:

1. The kind of spores produced and the time of appearance of these on a given medium, may in some cases be characteristic of the species.

2. Morphological studies revealed many characters of taxonomic importance.

3. A large number of measurements of the various spore forms found in culture show that while great variation exists, there is a given mode for each species.

4. From inoculations made on ginseng roots, apples and potatoes, one is forced to conclude that the parasitism of the Phytophthoras is of a low order. The value of cross inoculations in taxonomic work is therefore doubtful.

5. As a result of the above studies a table may be constructed for the separation of these species.

A bacterial leaf spot disease of celery. IVAN C. JAGGER

During the last five years the writer has had under observation in central and western New York state an apparently undescribed leaf spot of celery. It occurs very commonly in that region, but so far only a few cases of noticeable injury to celery crops have been observed. The spots are of a rusty brown color, irregularly circular in outline, and rarely exceed 5 mm. in diameter. They closely resembly the spots due to Septoria. The two are with certainty distinguishable only by means of the pycnidia in the Septoria spots. The brown spots are filled with short rod shaped bacteria, which stain readily with carbol-fuchsin in fixed material. Bacteria have been repeatedly isolated by pouring dilution plates, characteristic spots reproduced by inoculating with pure cultures through needle punctures, and apparently the same organism reisolated. A morphological and physiological study of the organism is being made.

The spindling-sprout disease of Potatoes. F. C. STEWART

Potato growers on Long Island use much northern-grown seed because experience has shown that home-grown seed is of uncertain quality. It may be good or it may be poor. Frequently, it gives thin stands of plants very uneven in size. In 1914, nearly all fields planted with home-grown seed were affected in this way. Many seed pieces failed to make plants, while others produced very slender sprouts which made small, weak plants. The seed pieces did not rot prematurely, there were no lesions of any kind on the sprouts or stems, there was no spotting, rolling or curling of the leaves or any other pathological symptoms. The tubers produced by affected plants were small, but otherwise normal in appearance.

Plainly, this trouble originates in the seed tubers. Affected tubers may be readily detected by the very slender sprouts which they produce, but in no other way. It is suspected that the exceptionally hot, dry weather in the summer of 1913 was responsible for the weakened condition of the tubers. Appel gives drought as the probable cause of similar trouble in Germany in 1912 and Orton considers overheating of the soil responsible for its occurrence in the South.

Thrombotic disease of maple. W. H. RANKIN

Preliminary investigations of a disease of hard maples found near Claverack, New York, have revealed some interesting facts. The first sign of the disease is a withering and drying of the leaves without change of color except a slight blanching. After one limb is so affected, other limbs either directly above or below are killed and thus the disease progresses until within a month or two the tree is dead. Young and old trees are affected alike. Likewise, there is no difference shown between recently transplanted trees and those which are forty or more years old and in their original position.

An examination of the diseased limbs shows no fruiting bodies of a fungus and the bark on recently killed limbs is apparently healthy. However, upon cutting into the sap wood of the current season's growth, it is found to be very markedly streaked with dark-green lines running with the fiber. Mycelium is abundantly present but

no marked dissolution of the xylem elements takes place. The dark green streaking is due to the abundant production of sclerotia of that color which are packed in the tracheae and the tracheids. Conidia are also produced within the host.

Pure cultures of the causal fungus were obtained and it proves to be a species of Acrostalagmus. Inoculation experiments and other investigations are in progress.

A mutation in Phyllosticta. C. HARVEY CRABILL

Among several species of fungi which have been isolated from frog eye leaf spot of apple is one which answers closely to the descriptions of Phyllosticta except that it bears chlamydospores, which have never been reported in this genus. However, no violence is done in calling this species Phyllosticta until it can be accurately placed taxonomically.

What is undoubtedly a mutation has occurred in a pure Petri dish culture of this fungus. The mutant is in all respects identical in morphological characters and physiological reactions with its parent except that it is non-fruiting. By special stimulation it is possible to make the mutant produce rudimentary fruiting bodies but no spores.

A Nectria parasitic on Norway maple. MEL. T. COOK

This disease has been under observation for the past two years. The symptoms bear a striking resemblance to those of the chestnut bark disease (*Endothia parasitica*) the leaves wilt and the branches die. This was found to be due to a canker which girdled the branch. The infection evidently occurs through a wound, frequently a broken twig. The bark of the diseased area blackens and becomes depressed. The causal organism is a Nectria, probably *N. cinnabarina* or *N. coccinea*. The disease has been studied on an isolated group of Norway maples on which it proved very destructive. Stimulation of the trees with heavy applications of fertilizers during 1914 has increased their vigor and resistance. The disease has been found doing considerable damage on two trees on other parts of this same estate. Both trees were destroyed. It has also been found in a nursery, where it was apparently saprophytic.

An unreported fungus on the oak. C. A. SCHWARZE

This leaf spot was collected on black oak at Vineland, N. J., and chestnut oak at Hamilton Square, N. J., and on red oak at Red Bank, N. J. The spots are from 3 to 8 mm. in diameter, light reddish brown in color with a narrow dark brown border, eventually becoming uniformly brown with an irregular outline. The pycnidia are numerous, black and on both surfaces of the leaf. The spores are light yellowish brown color; measuring 5.0–7.7 × 10.0–15.0μ. They germinate readily.

An examination of the literature for this, or some related species, showed a new species described by Saccardo (Annales Mycologici 11: 315) as *Actinopelte japonica*. He describes the fruiting body as an ascus containing a single very large spore. Later Theissen (Annales Mycologici 11: 507) redescribed and figured it, but demonstrated that the ascus was a true conidia-spore. Our specimen is very similar to this one and the fruiting body is without doubt a true conidia-spore.

The use of sulphur for the control of potato scab. H. CLAY LINT

Investigations on the influence of sulphur in the control of potato scab (*Actinomyces scabies*) have been conducted for the double purpose of obtaining data on the effectiveness of this element and also to determine the influence of the various factors involved. The results thus far, which permit the drawing of tentative conclusions, are as follows: (1) Spring applications are more satisfactory than fall applications;

(2) the benefits were greater when applied to land on which no cover crop had been grown the preceding season than on land where such a crop had been used; (3) seed treatment with formaldehyde and application of sulphur to the soil gave better results than the sum of these two treatments used separately; (4) broadcasting of the sulphur on the soil after planting is the best method of application; (5) sulphur is more effective with ammonium sulphate than with sodium nitrate, with acid phosphate than with steamed bone, and with muriate than sulphate of potash.

Citrus canker. A. B. MASSEY

A serious disease, "Citrus Canker," appeared in south Alabama and localities of Florida about two years ago, but came to our attention in January 1914.

By isolation cultures, artificial inoculations and reisolations the cause has been proved to be due to a species of Phoma.

It has been found on a number of different species of citrus but its greatest damage is confined to the grape fruit and hardy orange (*Citrus trifoliata*) stock. It attacks seriously the fruit, twigs and leaves of the grape fruit, causing the leaves to drop and injuring the marketable quality of the fruit. In the hardy orange no case of fruit infection has been found, but the twigs and leaves are heavily attacked causing defoliation and serious injury to the young twigs.

The disease has been found on hardy orange stock in Texas and specimens have been received from Japan, seeming to indicate that the disease has come to us on nursery stock from Japan by way of Texas.

The citrus canker situation. R. KENT BEATTIE

A new oriental disease far exceeding the chestnut bark disease in infectiousness has recently made its advent in the Gulf States. The citrus canker occurs on all species of citrus but is especially severe on grape fruit. It develops upon leaves, stems and fruit. It may kill young trees but does not develop girdling cankers on older stock. Its chief injury is to the fruit. The Satsuma orange is highly resistant.

The disease was brought from Japan on Satsuma or *Citrus trifoliata* stock and has been nursery-distributed throughout the Gulf States. Quarantine measures and the destruction of infected trees and nursery stock by burning are being used to combat it.

This disease offers a splendid illustration of the danger to which we are constantly exposed from plant diseases existing unrecognized in far-off corners of the earth.

Leaf spot and some fruit rots of peanut. FREDERICK A. WOLF

This study concerns itself with the leaf spot caused by *Cercospora personata* (B. & C.) Ellis, the red rot, *Neocosmospora vasinfecta* E.F.S., and the sclerotial rot, *Sclerotium Rolfsii* Sacc., the first of which attacks leaves, petioles, and stems and the other two appear as fruit rots. *Cercospora personata* has been found to overwinter in Alabama in the conidial stage in the fallen diseased leaves. New crops of conidia may be formed on the old conidiophores. The conidia are also found in the centrifuged washings of the peas and it may be that this serves as a means for the introduction of leaf spot into new localities. Structures in the nature of spermagonia and spermatia are developed within the old conidial stromata. While an ascosporic stage has never been observed to occur in connection with this Cercospora, the presence of these spermagonia is taken as indicative that a sexual stage may rarely occur. *Neocosmospora vasinfecta* on peanuts is found to be identical with the organism on cotton as the result of a comparative study of pure cultures. It appears to have not been previously reported on this host and is not parasitic. *Sclerotium Rolfsii* is an active soil parasite not only on peanuts but on a great many kinds of cultivated plants.

Hosts of brown-rot Sclerotinia. J. S. NORTON

A number of species of fruits have been inoculated with conidia of the common brown-rot fungus of orchard fruits. On the following, conidia developed: Cherry, wild-goose plum, blackberry, Japanese plum, Damson plum, green corn, pear, peach, apple, *Prunus serotina*, strawberry, crab apple, Crataegus, *Pyrus betulifolia*, dried prune, peach, apricot, raisin. About fifty species of many families, including Rosa, Amelanchier, *Rubus occidentalis*, *Pyrus arbutifolia*, and *Cydonia Japanica*, showed no outward sign of infection.

Resistance to Cladosporium fulvum in tomato varieties. J. B. S. NORTON

Of 256 plants of fourteen varieties of tomato grown in the greenhouse in the early spring of 1914, nearly all were badly affected with Cladosporium, except Stone and Sterling Castle, which were practically immune.

Loss from mosaic disease of tomato. J. B. S. NORTON

Mosaic disease has been very prevalent over thousands of acres in Maryland for at least three years. The effect on yield is not certain. Measurements in the greenhouse showed that plants first attacked by the disease bore scarcely less weight of fruit than those remaining healthy longest, but 33 per cent more fruit set on the healthier plants. The plants averaged higher the later they showed disease.

Notes on soil disinfection. CARL HARTLEY

The disinfection of pine seed beds was investigated at western nurseries. It was necessary not only to disinfect the soil, but to leave it in such condition that reinfection would not be favored. Heating failed because it left the soil in too good condition for the re-establishment of parasites. Sulfuric acid, copper sulfate, and zinc chlorid were more effective prophylactics than formaldehyde, being fairly effective even where applied the preceding autumn. Methods have been developed by which these disinfectants are kept from injuring pine seedlings. These methods will not prevent injury to many angiosperms. Acid is much cheaper than formaldehyde and is now in regular use at several nurseries. The soil at one nursery contained carbonates, and effervesced strongly when treated with acid solution. Here acid failed and toxic salts proved best. Precipitation of copper salts in this soil is delayed by adding ammonia, but tests so far indicate no resulting benefit. Forty-five other substances have been tested. Only sugar, acetylene, and arsenicals seem worth further test.

Acid treatment, followed two days later by lime, is recommended as a possible substitute for heating for crops which do not tolerate acid alone.

Inoculation experiments conducted on steamed soil only are unreliable.

A wilt disease of Japanese and hybrid plums. B. B. HIGGINS

During the last ten years many cases of serious destruction of Japanese and Hybrid plums by a disease, known locally as "plum wilt," have been reported to the State Experiment Station from Georgia and some of the neighboring states. In one case three-fourths of an orchard of twelve hundred trees were killed by this disease. Because of these ravages the growing of these plums has become a very hazardous enterprise.

The disease is caused by a fungus which enters through wounds. From the point of entrance the fungus hyphae pass rather slowly toward the center of the tree as well as up and down through the water ducts, causing the formation of gum which

plugs up the ducts and cuts off the water supply from the distal portion of the tree. The leaves wilt suddenly and then dry up. If the point or infection is near the base of the tree, as is most frequently the case, one side of the tree, often a single large branch, will wilt first, then a month or so later the rest of the tree. Apparently about a year is usually consumed from infection to the death of the tree.

The fungus has been isolated and grown in pure culture, and its parasitism proven by inoculations in the field and in the greenhouse; but its identity has not yet been definitely determined.

The perfect stage of Phyllosticta Paviae Desm. V. B. STEWART

In May 1914 mature perithecia were found on the underside of diseased horsechestnut (*Aesculus hippocastanum*) leaves that had been exposed to the winter. Ascospores shot out onto sterile plates of agar and transferred in a sterile drop of water to leaves of horsechestnut seedlings produced lesions of the leaf blotch disease within ten days and pycnidia of *Phyllosticta Paviae* developed after three weeks. Repeated infections obtained with ascospores indicate that the perithecia are the perfect stage of *Phyllosticta Paviae* Desm.

Peck described an ascomycete, *Laestadia aesculi* Pk. on petioles of fallen horsechestnut leaves. Peck's fungus and the one found by the writer appear to be identical, the name *Laestadia Aesculi* Pk. is proposed therefore as the sexual stage of *Phyllosticta Paviae* Desm. causing the leaf blotch of *Aesculus hippocastaneum*. Perithecium 180μ in diameter, with ostiole; ascus subclavate; 8 subelliptical spores, 6 by 11μ. Ascospores developed a mycelium on sterile horsechestnut twigs similar to the fungus isolated from *Phyllosticta Paviae* Desm. Lesions. Ascospores failed to grow on artificial media. No fruiting bodies developed in any of the cultures.

Studies on Plasmopara viticola. C. T. GREGORY

Infection takes place only through stomates, never through injuries. Experiments have demonstrated that conidia sown on the upper surface of the leaf may cause infection provided a continuous film of water extends over the margin to the lower surface.

The germ tube becomes greatly attenuated as it passes through the stomatal opening but in the substomatal cavity it assumes a form similar to the quiescent swarmspore and may be termed a secondary spore. One or more hyphal filaments are produced from the secondary spore.

Haustoria originate as minute, lateral projection. At the point of penetration the host cell wall thickens considerably resulting in a thick cellulose sheath about the tube of penetration. The distal end of this tube becomes globose and dissolves through the thickened cell-wall leaving a goblet-shaped basal sheath. The host plasma membrane is never penetrated.

The discoloration of the lesions is due to decomposition of the chlorophyl and chloroplastids.

The swelling of the stem results from hypertrophy of the cells and the intussusception of mycelium between the cells.

Though conidiophores are usually produced through stomates they may burst through the loose tissue above the veins or directly through the epidermis of the flower pedicle. The inability of the fungus to fruit on older berries is due to the absence of stomates.

A new rust of economic importance on the cultivated snapdragon. GEO. L. PELTIER and C. C. REES

Within the last four or five years the snapdragon has become one of the more important of the minor greenhouse crops in commercial floriculture. Consequently, a large number of new varieties of this plant have been originated and grown in all parts of the country. Coming under cultivation it is not surprising to find that its culture is being seriously impaired by a new rust which appeared in the vicinity of Chicago in August 1913. Within the next two months four new areas of infection had been located within a radius of fifty miles from the point at which the disease was first reported. During the autumn of 1914 it again caused considerable damage in the field in the vicinity of Chicago.

In September 1914 it was reported from two localities in Ohio and in November from Indiana. No doubt within a short time it will also be reported from neighboring states.

The rust appears on the plants in the field about the last of July. The uredo stage persists until fall when the teleuto pustules are found on the stems and branches. The uredo stage is also found in the greenhouse throughout the winter on cuttings, seedlings, and later on the mature plants. Toward spring the rust seems to die out in the house, reappearing in the field during the late summer.

This rust was first described by Dietel and Holway as *Puccinia antirrhini* in 1895 on cultivated snapdragons from California and Oregon. Outside of this description, there has been no reference made to this rust up to the present time.

The relation between Puccinia graminis and host plants immune to its attack. E. C. STAKMAN.

In a great many cases, both with cereals resistant to a biologic form of *Puccinia graminis* and wheats resistant in varying degrees to the attacks of *Puccinia graminis tritici*, varying degrees of infection occur. In some cases fairly large areas of the host tissue are killed outright by the fungus and only small pustules of rust are developed. In other cases the flecks indicating the death of the host tissue are extremely small. In extreme cases, no flecks whatever are visible to the naked eye. A histologic study of infection in such cases indicates that small area of the leaf comprising sometimes only four or five cells are killed and the fungus is then unable to develop further. In case of normal infection this killing of the cells by the hyphae does not occur. Whether or not hypersensitiveness of the host plant towards *Puccinia graminis*, which is unable to infect it, is a universal phenomenon is not yet determined. However, it seems to be of fairly general occurrence.

Further studies on the spread and control of hop mildew. F. M. BLODGETT

Observations made on hop mildew, *Sphaerotheca Humuli*, at two separate places in New York during the past two seasons have fully confirmed the conclusion reached by the writer in 1912, viz., that the principal relation of the weather to the spread of the mildew consists in the appearance of the mildew in new places on the leaves about ten days after each rainy period.

Control experiments have been continued. In six experiments the percentage of hops free from mildew on unsulfured plats was five; on sulfured plats seventy-eight. The results of comparisons between the different kinds of sulfur were not so conclusive. The amount of mildew frequently varies more from one part to another of a yard than between two plats sulfured with different kinds of sulfur. When sulfur is applied under favorable conditions, there is the further difficulty, that all kinds

give so nearly perfect control that a comparison is impossible. A summation of the results in yards, where the test was most severe, seems to show a slight advantage in favor of ground sulfur. The sulfur and lime mixture has again proven less effective than sulfur alone.

The longevity of pycnospores and ascospores of Endothia parasitica under artificial conditions. F. D. HEALD and R. A. STUDHALTER.

Pycnospores in suspension in water show a slow but gradual reduction in the number remaining viable. At temperatures from 42° to 75° Fahr., one-third were viable at the end of 49 days. At freezing temperature or below the loss of vitality was less pronounced. When separated and allowed to dry, pycnospores are much less resistant than if dried in the form of sporehorns. When dried on glass, 66 to 78 per cent were killed by the process of drying, and none remained viable for more than two weeks.

When separated and allowed to dry from suspension in water, ascospores are much less resistant to desiccation than when dried in the perithecia or as spore-prints on object slides. 86 to 94 per cent of such separated ascospores were killed in the process of drying, and none remained viable for longer than 35 days.

Desiccation of spores on a glass surface gives conditions much more severe than those normally found in nature. The vitality of separated spores when dried on living leaves or bark is greater than if dried on a glass surface.

Field studies of apple rust. N. J. GIDDINGS and ANTHONY BERG

Field studies of apple rust, undertaken by this Experiment Station in 1912, have been continued during the past two seasons.

Spraying experiments have given results as follows:

1. It appears impracticable to control this disease in commercial orchards by the use of liquid sprays.

2. Spray material applied a week previous to infection did not appreciably reduce the amount of disease.

3. So far as can be determined, at the time of writing, commercial lime sulphur gave best results, while Bordeaux mixture ranked second, and atomic sulphur third.

Some orchards about three-fourths of a mile from cedar trees were infected to a sufficient extent to cause considerable injury and defoliation. The effects of a severe rust infection may be noted on trees for at least two years following it. It is believed that heavy infection of a cedar tree is followed either the first or second season afterward by a loss of vitality and inhibition of growth which renders that tree practically immune for one or two seasons. Cedar galls which were not permitted to freeze developed in the same manner as those left out of doors.

Cotyledon infection of cabbage seedlings by the bacterial black rot. CHARLES DRECHSLER

Cabbage seedlings grown in soil that had previously been inoculated with *Pseudomona compestris* (Pam.) Smith were frequently found attacked by black rot. The marginal tissue along the sinuses were first blackened; wilting accompanied by a slight discoloration followed, leading to a rapid collapse of the plant.

Specialized water pores are not found on cabbage seedlings. Until the hydathodes on the secondary leaves have become functional, these cotyledons may, however, function in guttation, extrusion taking place by means of unspecialized stomata along the sinus. Stained sections showed that the bacteria enter through these stomata, the points of original infection being limited to the area active in guttation.

The disease was induced also by inoculating droplets extruded by the cotyledons.

Fungus-host relationship in black knot. E. M. GILBERT

A microscopical study of the formation of the black knot gall brings out a few interesting details.

A considerable portion of the hypertrophy is in regions not directly in contact with the fungus. There is a considerable increase in size as well as in number of cells.

The cytoplasm of the hypertrophied cells is found to be greatly vacuolated and no longer behaves normally in its staining reactions.

The continued invasions of the fungal hyphae causes a separation of cells into larger and smaller masses. During this process some of the cells gradually fill with a granular substance which finally becomes resinous in nature and is exuded from the mature knot. Other cells disintegrate, the cell walls break down, the cytoplasm disappears, and at this time it is not uncommon to find the host nuclei lying free between the hyphae of the fungus.

During this stage the host nuclei undergo many variations, becoming much reduced in size, and greatly modified in shape and structure.

Stigmonose: a disease of fruits. M. B. WAITE

For several years the writer has been observing a certain disease in and under the skin of Japanese plums, pears and apples, which he wishes to designate by the term "stigmonose." The injury produced is the after effect of insect punctures. Ever since Woods originated the term "stigmonose" in describing a carnation disease, we have had this term available for designation of similar injuries to other plant tissues.

Plant bugs were observed puncturing and sucking the juices from Red June and Abundance plums, and an abnormally hard red spot was seen to follow the result of the puncture, except where the spores of Sclerotinia entered and rotted the fruit. The spot remains firm and hard, though possibly streaked with brown after the plum ripens.

On pears stigmonose forms a hard, sunken, slightly atrophied, greenish spot from 8 to 12 mm. or more across and slightly greater in depth. In late pears it may eventually become brownish. The feature on pears is the fusing of the groups of stone cells into a hardened mass.

On apples a similar sunken, greenish spot is produced by the early punctures of plant bugs. The spot later becomes corky and dry, resembling bitter pit.

Aphis punctures produce much more numerous and obscure sunken spots still more resembling bitter pit. Stigmonose effect is often observed on the apple around curculio feeding punctures and scars made by the ovipositor.

Jonathan spot, bitter pit and stigmonose. CHARLES BROOKS, F. D. FISHER

In experiments on the above diseases it has been found that both Jonathan Spot and Bitter Pit are usually worse on large apples than on small. Bitter pit is increased by continued heavy irrigation, by continued light irrigation, and by sudden checks in the water supply to heavily watered trees. In the latter case if the sudden drouth comes at mid-season the effects may become more extreme than typical bitter pit, the fruit developing large dead areas beneath the skin and very high coloration on the surface while the fruit is still green. In such cases drops of sticky exudation often appear on the affected areas and the fruit ripens prematurely.

Stigmonose is used to refer to responses to insect attacks. In certain cases the effects on apples can scarcely be distinguished from bitter pit. The development of

one form of this trouble seems to be closely associated with the occurrence of the rosy aphis. It differs from bitter pit in that it develops earlier in the season, that it occurs on the fruit that is in the middle of the tree rather than that on the exposed limbs, that it is often followed by cracking of the fruit and premature ripening, is often accompanied by a corrugated gnarled appearance of the apple, that the spots are not typically at the ends of vasculars, that the brown tissue beneath has more definite margins, is more nearly spherical in shape, and is firm rather than spongy.

The organization of the plant disease survey. R. KENT BEATTIE

The object of the Plant Disease Survey is to centralize and make available for study data on the distribution of plant disease in the United States.

A Plant Disease Survey Committee has been appointed in the Bureau of Plant Industry. The various pathological offices are contributing to the financial support of the Survey. A system is being developed by which distributional data from the State collaborators and the department pathologists will be consolidated, analyzed, and made available.

The continued coöperation of the members of this Society is essential to the success of this undertaking. The Survey is more than a departmental affair. It is a united effort on the part of the pathologists of the United States.

Some technical aids for the anatomical study of decaying wood. E. W. SINNOTT and I. W. BAILEY

The following method is recommended for the microscopical study of decaying wood: Cut into pieces about 1 cc. in size. Kill wet material in 70 per cent alcohol and boil dry wood. Treat in strong hydrofluoric acid for one or two weeks according to the hardness of the wood. Dehydrate and embed carefully in celloidin, running from 2 per cent to 16 per cent and hardening in chloroform. Sections 5 or 10 micra thick may readily be obtained. Dissolve celloidin with ether and place sections for a few hours in a 20 per cent solution of tannic acid. Stain with methyl violet. Dehydrate rapidly with alcohol and mount in balsam. The mycelium takes the stain readily but the wood is in general unaffected.

Apple rots. CHARLES BROOKS, D. F. FISHER, J. S. COOLEY

The following fungi have been isolated from market and storage apples and have been found capable of producing a rot of the same: *Sphaeropsis malorum* Pk. * x; *Glomerella cingulata* (Stonem.) S. and v. S. x; Monilia sp. x; *Botrytis cinerea* Pers. x; *Phomopsis mali* Roberts; *Penicillium expansum* Link * x; *P. commune* Thom.; *P. pinophilum* Hedg.; *Mucor stolonifer* Ehrenb.; *Cephalothecium roseum* Cda.; *Aspergillus niger* (Cram.) v. Tiegh. x; *Trichoderma* sp.; *Pestalozzia guepini* Desm.; *Pestalozzia brevipes* Cke.; *Verticillium* sp.; *Ramularia macrospora* Fres.; *Fusarium radicicola* Wr.; *F. putrefaciens* Osterw., and several species or strains of Alternaria.*

The species that rot the fruit most rapidly are marked with an x, those that are of most common occurrence are marked with an *. In addition to the above a large number of other species have been isolated which produce rots of less economic importance. Of the above species *P. expansum* is the most common on storage fruit. During the past summer a particularly virulent strain of this fungus has been the cause of serious damage to immature fruit in the Northwest, in some cases destroying more than 10 per cent of the crop while still on the tree. Sphaeropsis and the Alternarias are the cause of most of the blossom rot in eastern states; the Alternarias and the Fusariums of the core rots of the Northwest. The Alternarias are also of common occurrence following Jonathan spot and scald.

The relation of temperature to the infection of cabbage by Fusarium conglutinans Wollenw. J. C. GILMAN

In connection with the work on disease resistance in cabbage carried on at the University of Wisconsin, field observations were made during the summers of 1912, 1913, and 1914, and the influence of environmental conditions on the attack of the yellows disease was noted. Since the attack followed high soil temperatures, experiments under control conditions were performed in the greenhouse to determine these factors more closely.

In these experiments a total of 12 flats of uniformly infected soil each containing approximately 200 plants and 46 pots each with 50 plants were used at different times throughout the winter and spring. In every case the disease was induced by a soil temperature of 17° to 22°C. or above, while no disease was found in the same number of flats and pots with soil brought in at the same time from the same field but kept at 14° to 17°C. After interchanging and replanting the flats and pots the disease was found only on soil at the same higher temperature; the seedlings on the cooler soil remained healthy. Poured plates were made in all cases and by isolation and determination the trouble was shown to be due to *Fusarium conglutinans* Wollenw.

These experiments show conclusively that the organism is dependent on a rather high soil temperature (17° to 22°C.) to produce infection. A more exact limitation of the temperature of infection and the reasons for this behavior on the part of the fungus remain to be determined.

Third progress report on fusarium-resistant cabbage. L. R. JONES

In 1914 trials were continued on "cabbage sick" soil in Wisconsin with the strains previously reported as showing resistance to the cabbage yellows fungus, *Fusarium conglutinans* Wr. These included comparisons of the standard commercial varieties of winter cabbage with the strains which have been selected from these, beginning in 1910. Previous reports have covered the results of the 1912 and 1913 trials. In 1914 the seed from the second generation selected for resistance gave gratifying results, both in the two experimental fields and in a number of farmers' trials.

Thus in a representative farmers' trial the commercial varieties showed at the end of the summer, an average of 42 per cent of the plants alive and 36.5 per cent headed, whereas of the resistant strain 99 per cent lived and 98.6 per cent headed.

In the two experimental fields the disease conditions were even worse and the outcome proportionately more striking. Although all of the selected strains continue to show a high degree of resistance there is one which has proved distinctly the best. The results from this in 1914 were as follows:

Field I.	Commercial:	56% lived,	31.5% headed,	1.85 tons per A.
	Resistant:	100% lived,	100.0% headed,	18.3 tons per A.
Field II.	Commercial:	36% lived,	17.0% headed,	2.25 tons per A.
	Resistant:	100% lived,	95.5% headed,	19.2 tons per A.

It seems justifiable to conclude that the disease-resisting quality which has thus shown itself in three successive generations is a fixed transmissible character. Commercial seed of the variety Volga again proved quite resistant. Seed was grown from heads of this as well as of certain other of the earlier market and kraut varieties selected last year. A strain of still a different type selected for disease resistance by Prof. T. H. White of the Maryland Experiment Station also proved highly resistant in our trials. There is reason, therefore, to hope that Fusarium resisting strains of various commercial types may soon be perfected and that their resistant qualities may not be restricted to a limited locality.

York spot and York skin-crack. H. S. REED

The fruit of the York Imperial apple has recently shown some new, or at least undescribed, troubles in Virginia, which caused the loss of much fruit in 1914. The York Spot appears to be somewhat different from the Jonathan Spot. It is characterized by much larger sunken areas on the fruit, which bear some resemblance to moderate hail injury. The tissue beneath the spots is dry and corky. Where the trouble is severe the superficial tissues are watersoaked. The trouble is most abundant on trees under fifteen years of age, or on older trees which have a very light crop of fruit.

The York skin-crack was first noticed by the author in 1911, but did not become serious until 1914. The skin of the fruit is at first pitted and then cracks open. Various decay fungi gain entrance in this way to the apple. There is, however, a rather constant association with a species of Alternaria, which has been isolated and is now under study in this laboratory. The skin crack appears principally upon the fruit of trees less than fifteen years of age.

Soil stain and pox, two little known diseases of the sweet potato. J. J. TAUBENHAUS

Soil stain or Scurf: This was first described by Halsted in 1890 under the name of Scurf. The term soil stain is more appropriate. This is a disease of the epidermis only. Beginning spots are round, small, not exceeding one-third of an inch. Only when the spots are numerous and coalesce do the affected roots have the stained appearance. According to Halsted, the trouble is due to a fungus, *Monilochaetes infuscans*, E. & Hals. Neither the species nor the genus were fully described. Dr. Clements in his "Genera of Fungi" and Engler and Prantel do not recognize the genus Monilochaetes and only mere mention is made of it by Saccardo in Syll. Fung., vol. 20. No infection experiments were recorded by Halsted. Successful inoculawith pure cultures were carried out. Investigations seem to indicate that the genus Monilochaetes is probably not well founded. The fungus is a slow grower on nutrient media. Affected potatoes are considerably reduced in value on the Eastern markets. The disease is confined to the underground parts and is carried with the seed. It holds over in lands heavily manured or limed. It is easily controlled by soaking the seed (roots) for ten minutes in a solution 1 ounce of corrosive sublimate in 8 gallons of water; it is eliminated from the seed by growing the latter from vine cuttings.

Soil rot, pox or pit: This disease too was first described by Halsted in 1890 and attributed to *Acrocystis batatas*. The disease attacks only the underground portions of the plant. The disease produces no rot; the lesions are sunken scabs, pits or pox. The disease works somewhat similar to the scab of the white potato. Fresh spots are dry and powdery and may easily be picked out, or dry and fall out when old, thus leaving a small pit. In badly infected soils it is very difficult to find a perfect shaped root. During the two years I have worked upon this disease, the fungus *Acrocystis batatas* has not been found associated with it. This summer about 500 plate cultures were made from lesions differing in size and age. In all cases a Fusarium was predominant. An Actinomyces and a Rhizoctonia also were isolated. Work with fertilizers and lime this season has shown that an excess of lime favors the disease and that an acid fertilizer such as acid phosphate (in excess) actually reduces the disease, thus showing its similarity to the scab (*Actinomyces chromogenus*) of the white potato.

Rhizoctonia in America. GEO. L. PELTIER

Early in the study of the carnation "stem rot" due to Rhizoctonia, it was deemed advisable to make a study of Rhizoctonia found on field, vegetable, and floricultural crops. Accordingly, about fifty forms of this fungus were obtained from various sources and a morphological and physiological study was undertaken in 1912.

After three seasons' work with these cultures, it can be stated at this time that while they do exhibit slight morphological differences, in cross inoculation experiments they all behave alike (when age of culture, etc., are taken into consideration).

All but two of the forms studied can be included under *Rhizoctonia solani* Kühn. The true *R. violacea* Tul. of Europe has not been reported in this country. One significant fact regarding *R. violacea* Tul. is that it has never been grown in pure culture, although this has been attempted repeatedly.

The Corticium stage has been studied on potatoes and several weeks obtained in this country and also on potato stems received from Europe. The European material was compared with *Hypochnus solani* Prill. & Del. by Dr. Pethybridge, and the two forms were found to be identical. This European form, when compared, by the writer, with the Corticium stage in this country, was also found to be the same. There can then be no question that the *Hypochnus solani* Prill. & Del. of Europe is the same as the *Corticium vagum* B & C, var. *Solani* Burt. Although the writer has traced the connection between the Rhizoctonia mycelium and the gray, felt like mass of the perfect stage and has obtained repeatedly pure cultures of Rhizoctonia from the hyphae composing the perfect stage, attempts to obtain pure cultures of Rhizoctonia from a single spore have failed.

Lightning injury to cotton and potato plants. L. R. JONES and W. W. GILBERT

Literature contains meagre data concerning lightning injury to herbaceous plants. The authors have evidence that such injury is not uncommon in certain crops, notably cotton and potatoes, and may occur in beets, tobacco and ginseng. Grass, small grains, and corn seem less liable. Cotton and potatoes when so struck may be killed in roundish spots, 1 to 3 rods in diameter or sometimes several associated smaller spots. There may be no disturbance of soil or physical rupture of plant tissues. The plants near the center wilt, blacken and die promptly; about the margins some may live days or weeks. Such weakened cotton plants yellow or redden. The injury appears first and worst from the soil line, or a little above, downward, but may not kill all the underground parts. Partially injured cotton plants may form callus ridges above point of injury and new potato shoots may sprout from base of injured stems. These various facts suggest the theory that when a sudden electric storm follows upon a period of dry weather lightning discharge spreads horizontally over the moist surface layer of soil and that certain crops are more liable than others either because of relative tissue resistance or because of character or distribution of aerial parts or root systems.

Orchard experiment with Jonathan spot rot in 1914. G. W. MARTIN

The results of the 1913 experiment indicated that the Jonathan spot rot is caused by a species of Alternaria and that infection occurred later than June 9 in that season. To check this result, apples were bagged, as in 1913, on June 5 and August 14, and both lots were examined and compared with unbagged apples. The apples bagged June 5 showed less infection than those bagged on August 14, while the latter lot agreed very closely with the unbagged apples. The results of this experiment are in harmony with those of 1913.

The perfect stage of the fungus of raspberry anthracnose. W. H. BURKHOLDER

During the early spring of 1914 examination of the affected canes showed minute pustules which were only found upon the diseased area. These pustules proved to be small raised portions of pseudoparenchymatous tissue of the fungus which always covers the anthracnose lesions. Embedded in this stroma are one to many blogose bodies, 20 to 30 μ in diameter. Each body is separated from the other by stromataceous tissue, no common cavity being present. Later in the spring these structures develop into asci containing eight 4-celled ascospores. Upon the rupturing of the stroma the asci, when moist, expand to approximately three times their usual length and shoot their spores into the air. The ascospores germinate by budding. These buds are identical in size and shape with the conidia of *Gloeosporium venetum*. Pedigreed cultures from single ascospores were obtained and these proved to be morphologically the same as cultures from conidia of the anthracnose fungus. Conidia were also produced in culture identical with those of *Gloeosporium venetum*. Infection experiments at present are incomplete.

N. N. Woronichin has recently described (Myc. Centbl. 4: 225–233) a similar fungus upon the leaves of *Pyrus malus*, and *P. communis*. For this he established a new family, Plectodiscelleae, and a new genus Plectodiscella, giving his fungus the name *Plectodiscella Piri*. The morphology of the fungus described above on raspberries is almost identical with that of the fungus of Woronichin upon Pirus.

The parasitism, biology and cytology of Eocronartium typhuloides Atk. HARRY M. FITZPATRICK

The writer has nearing completion the investigation of the parasitism, life history and cytology of the fungus parasite of moss *Eocronartium typhuloides* Atkinson. This fungus has been demonstrated to have a high degree of parasitism. The mycelium is intracellular and hibernates in the moss stem. Almost no injury to the host results although practically all the cells of the plant including those of the growing point are infested. Infection experiments have given positive results and study of longitudinal sections of the moss stem show the fungus to be perennial and prove that the external Typhula-like fruit body arises from the parasitic mycelium. On account of the intermediate position of the fungus between the rusts and the higher Basidiomycetes the facts of its nuclear history are interesting. The spores germinate in the uninucleate condition and the binucleate cells arise in the germ tube. Fusion and reduction takes place in the young basidium; the mature basidium being transversely septate into four cells, its homology to the promycelium being evident. Type material of *Typhula muscicola* Fr. and *Clavaria muscigena* Karsten obtained from the herbarium of Fries at Upsala has proved on examination to be Eocronartium in both cases. The fungus should therefore take the older specific name of Fries.

Negative heliotropism of the urediniospore germ-tubes of Puccinia Rhamni. F. D. FROMME

When germinating urediniospores of *Puccinia Rhamni* were exposed to a unilateral diffused illumination, during a period of four or five hours, more than 80 per cent of the germ-tubes grew away from the direction of the light. A small percent grew toward the light and the remaining tubes were transversely or irregularly disposed. The germ-tubes of controls in darkness grew in all directions.

The direction of light also determined, to a marked degree, the approximate point of origin of the tube. Urediniospores of this species have from six to eight

uniformly distributed germ-pores. In darkness the tube issued from any one of these pores, but with a unilateral illumination it almost always issued from a pore located on the darker side of the spore.

It is suggested that these negative heliotropic reactions possibly play an important part in bringing about the stomatal entrance of the germ-tube.

The ascigerous stage of Helminthosporium teres Sacc. A. G. JOHNSON

In the course of studies on the Helminthosporium diseases of barley, the ascigerous stage of *Helminthosporium teres* Sacc. has been found, as suspected, to be a species of Pleospora (= Pyrenophora Fr.). On March 25, 1914, mature perithecia were collected at Madison, Wis., on old barley straw. The following day a single ascus was isolated and placed on agar plate, with strict precautions against contaminations. A pure colony resulted which showed the characteristic mycelial growth of *Helminthosporium teres*. From this colony and transfers from it typical *H. teres* conidia were obtained. These were used to inoculate twelve healthy barley plants under glass. Typical *H. teres* lesions resulted on all. Controls healthy. Isolations from lesions yielded *H. teres* again. On April 11, four other single ascus isolations were made, each of which similarly yielded conidia typical of *H. teres*.

As to the specific identity of the Pleospora there remains some question. On basis of cultural work, F. Kløpin Ravn (1900) suggested Pleospora connection for *H. teres*, but did not secure mature perithecia. Subsequently various confusions have arisen among writers and various combinations of names used. Further comparative work is necessary to clear up this phase of the question.

A Gymnosporangium with repeating spores. J. C. ARTHUR

The large genus Gymnosporangium is notable among rusts for the absence of a repeating stage in the life cycle. The aecia, mostly on Rosaceous hosts, have shown no indication of being capable of repeating themselves on the same host species, and no uredinia, or even occasional urediniospores, have up to the present time been associated with any species of the genus. The only uredinia-like form known on Juniperaceae, which is the family bearing the telial hosts, is *Uredo nootkatensis* on the yellow cedar of the far northwest. This paper announces the discovery of telia in this form, and discusses their significance.

A preliminary report on twig and leaf infection of the peach by means of inoculations with Cladosporium carpophilum Thüm. G. W. KEITT

Previous work. No authentic report of artificially induced infection of peach twigs or leaves by *Cladosporium carpophilum* has been recorded.

Special difficulties encountered. (1) Abundance of natural infection in orchards where the disease is prevalent; (2) the slowness of infection; (3) the length of the period of "latent infection;" (4) the difficulty of securing at will in the field favorable conditions for infection.

Special methods consequently employed. (1) Conducting the experiments on young trees and nursery stock in a section (Madison, Wis.) practically free from peach "scab"; (2) using potted trees which could be placed at will under controlled conditions; (3) constructing moist compartments about small trees in the field.

Technique of inoculation. Forty-six trees, Elberta, Hill's Chili, and Champion, were inoculated in six series between May 22 and July 11, 1914. The spores were applied in sterile distilled water by means of atomizers or camel's hair brushes. The plants were then placed in moist compartments for periods varying from one to

ten days, after which they were transferred to the field. Each series was, of course, adequately controlled by one or more similarly treated plants uninoculated.

Sources of infection. Lima bean agar cultures of single-spore strains of Cladosporium isolated from "scab" lesions on (a) twig, (b) leaf, and (c) fruit of the peach.

Results. Abundant infection was induced upon leaves and twigs by each strain used. Over 50 lesions were counted upon individual twigs; over 100, upon individual leaves. The fungus was re-isolated from twig and leaf infection induced by each strain used.

On ten control plants, only one primary twig infection developed, while no primary leaf infection was found. In late September and early October, numerous small secondary infections appeared on the leaves and twigs of controls situated in close proximity to badly diseased plants.

Notes on cronartium comptoniae and C. ribicola. PERLEY SPAULDING

In the area where annual observations are made upon the mortality occurring in young *Pinus rigida* trees diseased by *Cronartium comptoniae*, it was found that eleven had died since last year. A number of cases have shown beyond question that *P. ponderosa* is very susceptible to the attacks of this fungus. *P. contorta* and *P. laricio* were reported this year as additional hosts for this fungus. The former, in the two localities were found, has shown even greater susceptibility to the disease than has *P. ponderosa*. In one case both *P. ponderosa* and *P. contorta* were so badly affected that the entire stock of both species was destroyed and no further attempt is to be made to grow them there. The fungus was transferred successfully from *P. contorta* to *Comptoniae asplenifolia* but not from *P. laricio*. It is distributed as far West as Michigan and Wisconsin and very likely occurs in Minnesota.

Cronartium ribicola, during the past season, has shown an aggressiveness that it hitherto has not shown in this country. This it is believed is due largely to favorable weather conditions. This year, for the first time, two-year wood of white pine was found bearing fruiting bodies. This year the American variety of gooseberry, Downing, has become infected quite liberally by the fungus in one instance.

A general warning against stem inhabiting Peridermiums seems necessary. These two species at least are destructive to nursery trees and may become equally destructive to native reproduction. Dr. Hedgcock's work with some of the other species has shown that they are also destructive and may very easily become a menace to nurseries in localities where they are present. A general campaign on the part of nurserymen located in proximity to natural pine reproduction should be instituted for the eradication of the alternate hosts for a considerable distance about their nursery.

How to know the polypores. W. A. MURRILL

The writer has divided North America into five regions and prepared descriptive handbooks of the pileate species occurring in each region. With these as a basis, he believes that important additions may be made to our knowledge of the species and their distribution. It is also his belief that the polypores as a group lend themselves exceedingly well to class study, both in morphology and taxonomy, since they may be collected all the year round and their characters are remarkably well preserved in the herbarium. The five regions are: (1) the northern United States and Canada. (2) the southern United States, (3) the Rocky Mountain region, (4) the Pacific coast, and (5) tropical North America.

Some problems of plant pathology in reference to transportation. F. L. STEVENS

The purpose of this paper is to call attention to the relation of plant pathology to transportation, more specifically as related to the question of the carriers' liability and responsibility. Some of the best known fungous agents which enter into this relation are briefly discussed.

A disease of red clover and alsike clover caused by a new species of Colletotrichum. P. J. O'GARA

Investigations of a disease of red clover (*Trifolium pratense* L.) and alsike clover (*Trifolium hybridum* L.) in the Salt Lake Valley and other districts in the state of Utah during the past season have shown that it is due to a species of *Colletotrichum* which has not been heretofore reported. The characters of the disease are in some respects similar to those caused by *Colletotrichum trifolii* Bain. As a rule, the stems are most frequently attacked at or near the crown, but it has also been noted that the attack may occur just beneath a cluster of blossoms. Attention is called to the diseased condition of the plant by the sudden dying and browning of the blossom clusters. Petioles and stipules are also attacked.

The main point of difference between this new disease and the one described by Bain is that no definite lesions or cankers are produced, these being more or less indeterminate in the case of the new disease. The characters of the new species of Colletotrichum also differ considerably from *Colletotrichum trifolii*, the conidia and setae being much larger. Other important points of difference have been noted and the organism is regarded as a new species of Colletotrichum.

The disease is widespread over the state of Utah where red clover and alsike clover are grown, and while time has been wanting for carrying out thorough investigation, it is believed that the disease is very destructive. Apparently, many fields have been seriously injured by this disease.

An anthracnose of Asclepias speciosa caused by a new species of Colletotrichum. P. J. O'GARA

An interesting disease of the stems and foliage of the common milkweed (*Asclepias speciosa* Torr.) was noted during the past season in the Salt Lake Valley. Attention was called to the prematuring of the plants, in which the most prominent characteristic was chlorosis. The plants soon became yellowed and withered, while normal plants remained green and continued to grow. An examination of the diseased plants showed that the stems were attacked near the surface of the ground by a species of Colletotrichum which, in severe cases, produced a complete girdling. The cankers are at first brown, finally becoming black. Frequently, spots are produced upon the foliage, these being light brown with dark brown margins. On both the stems and leaves, conidia are produced in large numbers, and en masse are salmon-colored.

The characters of the species of Colletotrichum causing the disease are unique in many respects. Setae are very rare and are sometimes entirely wanting. The acervuli with their spore masses resemble to a considerable degree certain species of Gloeosporium and it would seem that this fungus is intermediate between Colletotrichum and Gloeosporium. The writer proposes to describe this as a new species of Colletotrichum.

A disease of the underground stems of Irish potato caused by a new species of Colletotrichum. P. J. O'GARA

Potato growing in the Salt Lake Valley, Utah, has become a serious problem on account of several of the well-known diseases which are prevalent. However, in

addition to those already known, the writer has found a new disease which promises to be of some economic importance. While examining some badly diseased fields many plants were found to have dark brown or black cankers or lesions on the underground stems; these cankers often completely girdling the stems and sometimes involving them from just above the surface of the ground to the seed tuber. Stolons and tubers were also found infected. The cankers so much resembled Rhizoctonia infections that they were at first supposed to be caused by Rhizoctonia. A careful examination, however, showed the presence of a Colletotrichum, and no other organism was found which could be shown to be the causative agent.

The fungus produces enormous numbers of acervuli which are at first sub-epidermal but which later break through the epidermis, producing a large number of setae and relatively few conidia. The conidia are characteristic in that when they are fully matured a vacuole is found in the middle of each one. This vacuole might sometimes be mistaken for a spetum, The mycelium is at first few-celled and hyaline, but later becomes many celled and dark brown, forming sclerotia-like bodies from which arise the setae and conidiophores. When the potato stem dies and becomes dry, the sclerotia-like bodies are seen by stripping off the epidermis.

The organism has been cultivated in the laboratory for some time, having been grown on potato, carrot, sugar beet, rice, corn meal and neutral agar. On most media it fruits abundantly in about a week, producing the characteristic sclerotia-like bodies bearing the setae and conidiophores, these latter bearing the characteristic conidia. The writer proposes to publish this as a new species of Colletotrichum.

A preliminary report on the relation of grass rusts to the cereal rust problem. E. C. STAKMAN

Uredospores developed on grasses in the field were used to inoculate wheat, oats, barley and rye. It was found that *Puccinia graminis* from *Agropyron repens*, *A. tenerum*, *A. caninum*, *A. smithii* and *Hordeum jubatum* transfers quite readily to barley and rye, only occasionally to wheat and practically not at all to oats. The rust transfers very readily from *Dactylis glomerata* and *Poa nemoralis* to oats, but not to the other cereals. Experiments made to determine whether or not it is possible to modify or break down the specialization tendencies of these grass rusts by means of using cereals as bridging forms have yielded some positive but somewhat conflicting results.

Attempts were also made to transfer the rusts occurring on *Agrostis alba*. *A. stolonifer*, *Anthoxanthum odoratum*; *Calamagrostis canadensis*, *Poa pratensis* and *P. compressa* to wheat, oats, barley and rye, but, aside from the development of flecks in some instances and a few extremely small pustules in two cases, the results were entirely negative.

Some facts of the life history of Ustilago zeae (Beckm.) Unger. FRANK J. PIEMEISEL

During the past two summers inoculations, mostly by means of sporidia developed in pure cultures, were made on corn plants at various stages of maturity. Approximately 1850 inoculations were made and 500 check plants were kept. The results indicate that infection may take place readily without any injury of the tissues and that the infection is purely local. On very young corn plants successful infection often takes place, but not much of the tissue of the host plant is involved. Quite frequently the smut boils which are developed as a result of infection on very young plants become abortive. It has been found that fresh spores of the fungus germinate very readily in water. Sporidia are developed in great profusion. These sporidia remain viable after remaining on a cover slip in the laboratory for three months.

They have also been exposed to freezing temperature and retain viability after this exposure. Spores placed in a silo in the fall fail to germinate within two months from the time when they were placed in the silage. Whether or not they germinate in the silo or whether the various organic acids which are developed during the fermentation of the silage destroy their powers of germination, has not been definitely determined. However indications are that the acids developed are probably the chief agency in destroying the powers of germination.

A promising new fungicide. W. M. SCOTT

In December 1913 the writer began experiments looking to the development of a dry material for use as a substitute for lime-sulphur solution in spraying fruit trees. Of the various materials tested barium polysulphide in crystal form proved to be readily soluble in water and quite efficient in the control of the San Jose scale and oyster shell scale. Further experiments to determine the fungicidal value of this material were conducted under the writer's supervision in Alabama, Virginia, Pennsylvania and New York. Following the usual summer spraying schedule it was applied on apple trees at the rate of 3 pounds and 6 pounds, respectively, to each 50 gallons of water in comparison with lime-sulphur solution.

The barium sulphur when used alone or with arsenate of lead produced no injury to fruit or foliage and controlled fungous diseases to about the same extent as lime-sulphur solution. No serious outbreak of apple scab occurred on the checks in any of the experiment orchards, so that the test could not be considered a severe one, so far as this disease is concerned. However, in a peach spraying experiment conducted at Hancock, Md., barium sulphur crystals used at the rate of 3 pounds to 50 gallons of water controlled peach scab (*Cladosporium carpophilum*) almost completely, while 98 per cent of the unsprayed fruit was affected. It is evident, therefore, that this material has decided fungicidal properties, and in the writer's opinion it is worthy of further investigation.

Some effects on chestnut trees of the injection of chemicals. CAROLINE RUMBOLD

Stains injected into living chestnut trees were found to have passed up and down the trunks in restricted areas. The branches and roots on the injected side would be stained, while the uninjected side of the tree was not. The stains were found to differ in their method of passage through the tissue. Methyl green passed through the traehae in the last year ring of wood, frequently just through groups of traechae. These groups often were in a corroded condition while the vessels lying between them were unstained. Congo red and trypan blue spread over larger areas. They passed through traechael tubes as well as the traehae and corrosion did not appear in the stained regions. So far the experiments show that colloidal stains spread further through the trees than crystalloidal. Some of the injected chemicals behaved like methyl green, while others, especially the colloidal metals like congo red. The chemicals, whether metals, acids, alkalies or benzenes appear to have profoundly affected cells lying beyond the paths of the injected solutions, causing pathological growth. The leaves on the injected trees showed blotches which were found to be characteristic of the chemical injected. In the case of lithium injected trees, the presence of the metal was found in bark, leaves and fruit.

The potato study trip of 1914. W. A. ORTON

A party of potato specialists—pathologists, breeders, and agronomists—from the United States Department of Agriculture and several state experiment stations

visited the principal potato sections in New Jersey, Maine, Vermont, New York, Michigan, Wisconsin, Minnesota, Colorado, Utah, Idaho, Washington, Oregon, and California. The journey began July 27 and ended October 2.

Dr. O. Appel, of Berlin, participated at the invitation of the United States Government. Dr. H. T. Güssow, of Canada, and Dr. Johanna Westerdijk, of Holland, were with the party for portions of the trip.

Informal field conferences were held in each state on diseases of potatoes, particular attention being given to those newer troubles disseminated through seed tubers, particularly leaf-roll, curly-dwarf, mosaic, wilt, etc., and on other potato seed improvement problems, such as loss of varietal vigor, influence of environment, quarantine laws and regulations, legal regulation of the seed trade, certification standards, methods of field inspection, standards and grades of seed potatoes, the encouragement of commercial production of pure-bred seed, the best sources of seed supply, hill and tuber-unit selections, the classification and relationships of potato varieties, the standards for commercial varieties, and potato breeding methods and principles.

The coöperation of the station workers and potato growers in the states visited contributed much to the marked success of the undertaking. The good results that were obtained warrant the hope that other study trips of a similar nature, directed toward other fields of pathology and undertaken at opportune times in the development of the work, will prove of great valve to science.

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LITERATURE ON AMERICAN PLANT DISEASES[1]

COMPILED BY E. R. OBERLY, LIBRARIAN, BUREAU OF PLANT INDUSTRY.

July 26 to September 25, 1914

Anderson, Harry Warren. Peronospora parasitica on Arabis laevigata. Phytopathology **4**, no. 4: 338. August, 1914.

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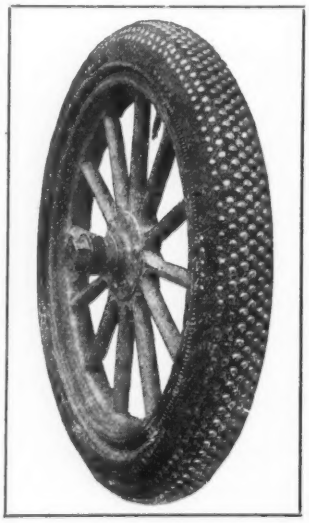

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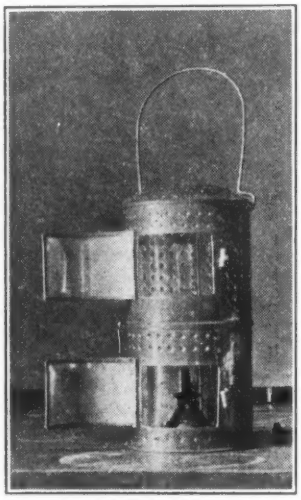

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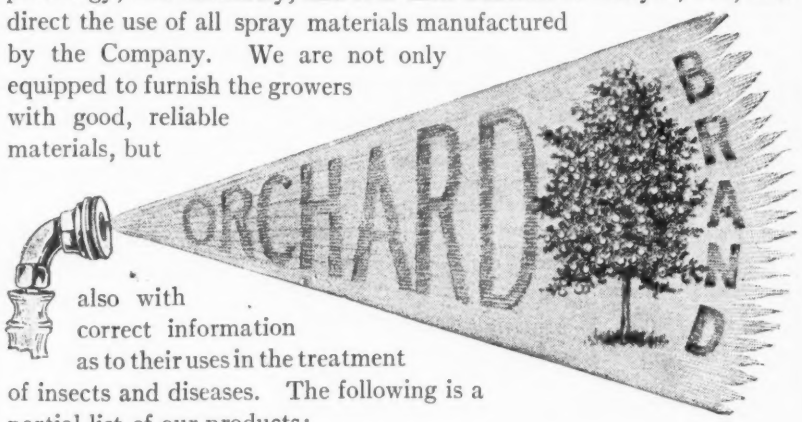

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